OUR BOOK SHELF

The Messenger of Mathematics. New series. Edited by Messrs. Whitworth, Taylor, Lewis, Pendlebury, and Glaisher. Vol. i. (Macmillan and Co., London, 1872.)

THE twelfth monthly number of the new series of the "Messenger of Mathematics" has just been published. This offers a convenient epoch for estimating the aims and achievements of this new mathematical periodical.

The principal aim of the editors was stated in their introductory note to be the fostering of a continuous and ample supply of original investigations into the more and more specialised branches of mathematics. This originality was to be welcomed from whatever quarter it came—whether from mathematicians of established reputation or from junior students of the science; whether from the Universities of this country or from more distant centres.

The intentions of the editors have been fully realised by the publication of the twelve numbers now before us. The list of the contributors to these numbers contains nearly twice as many names as there are numbers of the magazine. And while in that list we find the names of some of the foremost mathematicians of the age, such as Messrs. Cayley, Routh, Stokes, and Townsend, we find also a considerably greater number of the names of junior students, some of whom have only recently graduated. The localities of the contributors are also as various as was intended, one of them, for example, writing from Queensland.

As regards the articles themselves, there are about four times as many on pure mathematics as there are on applied mathematics. Among the former we find, for example, such a simple matter as a very elegant proof, by Mr. Taylor, of Euclid, ii. 8, in which he makes a further step towards the elimination of the diagonals from the diagrams of the Second Book of Euclid. This construction is recommended to the attention of the Association for the Improvement of Geometrical Teaching. We find also such interesting contributions to the study of the higher geometry as Prof. Cayley's articles on the "Theory of Envelopes," and on "Penultimate Quartics;" Mr. Merrifield's article on "Families of Surfaces;" and Mr. Townsend's on "Confocal Quadrics." The articles on other branches of pure mathematics are as varied and as instructive as those on geometry. There is, for example, a spirited controversy between Prof. Cayley and Mr. Wilkinson, about the quantitative limitations which have, in more recent times, been imposed on the generality of Taylor's theorem. Prof. Cayley's plea for greater liberty of interpretation, and against confining our symbols in mathematics so exclusively to quantity, is especially effective and well-timed; for the more liberal our interpretations the vaster will be the domains we can overrun and occupy by means of our symbols, and the greater will be the tendency to that specialisation of efforts, or division of labour, which is so characteristic of modern mathematical research, and which the publication before us aims to combine by co-operation. Then there are "Exercises on the Integral Calculus," by Sir John Cockle, and papers on "Definite Integrals," by Glaisher; besides articles treating of many other subjects, too numerous to mention.

Among the articles on applied mathematics we find one by Prof. Stokes, on the "Compound Pendulum;" two by Mr. Routh, on the "Oscillations of a Heavy String," and an improved solution of a problem in the Astronomer Royal's "Undulatory Theory of Optics;" one by M. Leclert, on "Naval Geometry;" two by Mr. Hopkinson, on "Electricity;" and so on. There is also a most elegant model of mathematical style, especially suitable for intending competitors in mathematical examinations, namely, the solutions, by Prof. Cayley, of the whole of a Smith's Prize Paper, which are of the stiffest ever set.

With all its variety of contents, this magazine is still eminently readable, principally on account of an utter absence of that tendency to riot in new terminology, or scientific slang, which disfigures the pages of some modern mathematical writers. The typography is also very good.

We shall be well satisfied if vol. ii. maintains the high standard set by vol. i.; but we should be pleased to find in it a little larger proportion of articles on applied mathematics. There is much interest felt at present in such subjects as molecular mathematics; the theory of electricity and magnetism; the determination of the centres of gravity of ships; and such like problems in advanced theory or in complicated practice. We should be glad to see the miscellaneous portion of the magazine, containing notices and reports of the meetings of mathematical societies, reviews of books, &c., somewhat extended, even if the present very moderate charge of a shilling a number was somewhat exceeded in consequence. There has been, for example, no notice of the large and influential meeting held last January by the Association for the Improvement of Geometrical Teaching. Now, in that association the want of a monthly organ is much deplored. Why should not the "Messenger" fill that void? Perhaps, also, if the size of the "Messenger" were increased, space might be found for queries and notes from correspondents; and the name might be advantageously altered to "The Mathematical Magazine." But, in any case, every student who wishes to keep abreast of the current of contemporary mathematical thought should subscribe to this excellent little periodical.

LETTERS TO THE EDITOR

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. No notice is taken of anonymous communications.*]

Spectrum of Lightning

ON the 11th inst. there was a considerable thunderstorm in Patterdale, and I was again able to observe the lightning spectrum. Among other lines I saw one repeatedly near D_1 and about the centre of the bright yellow band between the two masses of atmospheric absorption lines in that neighbourhood. I also saw the line near *b*. Both correspond in position with principal air-lines.

But besides this line spectrum I repeatedly saw a continuous spectrum with bright bands, which might have been the low temperature nitrogen spectrum, though I feel no certainty that such was the case. There seems, however, no doubt that lightning gives two different spectra, one of bright lines, and the other continuous;[1] unless indeed the latter be identical with the former, but with the lines much expanded. I do not think this is the case.

HENRY R. PROCTER

P.S.—Since writing the above there has been another thunderstorm, during which I more distinctly saw the band spectrum. I find that it is not the ordinary nitrogen band spectrum, but might be a very much expanded line spectrum. It is however difficult to understand the cause of so great a difference, for the line spectrum was very sharp and well defined. I thought I was able to recognise that the latter corresponded to the shorter and sharper peals of thunder. The spectrum showed no connection with the brilliancy of the flash. I recollect that in a brilliant thunderstorm which I lately witnessed at night in Syria, some flashes lighted up the dull foliage of the prickly pear to a vivid green; while others, showing the form of the landscape with nearly equal distinctness, left it almost colourless. I had then, unfortunately, no spectroscope.

Patterdale, Penrith, July 12

Aurora of July 7

THE very fine aurora of Sunday night, July 7, was well seen near Leenane, on Killary Harbour (lat. 53° 36′, long. 9° 45′, nearly), in the west of Ireland. Probably this is the most

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westerly station in Europe from which the phenomenon has been observed with some approach to accuracy; and if the centre of the corona be, as it seems to be (*pace* some of your correspondents), an actual, substantive point, and not merely the effect of perspective, the following observations may help in determining its height above the earth. At 11.0 exactly, Greenwich time, the centre of the very well developed corona had an altitude of 68°, with an azimuth bearing of 21° E. of S., a little W. of magnetic S. (these measurements being taken as correctly as could be done with a good-sized compass furnished with a clinometer), and it was distant from α Lyræ (*Vega*) about 8° towards S.W.; this distance being afterwards diminished by the rotation of the earth. The aurora was observed independently by Messrs. Kinahan and Symes, of the Irish Geological Survey, in the same neighbourhood, and they also noted the proximity of the centre to the above-mentioned star. I do not trouble you with other details.
M. H. CLOSE

Newtown Park, Black Rock, Dublin, July 13

I WITNESSED last night what must have been a somewhat brilliant display of aurora. From 10.45 P.M. to 11.0 P.M. slight breaks in the N.E. were brightly lit up with a rosy glare, and another break in the N. with the green rays. Coruscations of light flashed up from time to time, and were visible even through the clouds, which consisted of somewhat dense nimbus. The display in a clearer sky must have been decidedly fine.

Bridport, Dorset, July 8
J. EDMUND CLARKE

Registering Thermometer

MR. WHIPPLE and Mr. Bushell have shown great ingenuity in suggesting remedies for the copious condensation of moisture which takes place in the interior of the jackets of minimum thermometers on the grass.

Both their suggestions I have found fail to work a permanent cure; the chloride of calcium (only of use when the stopping is perfect) soon becomes super-saturated, and itself gives off moisture. The putty and sealing-wax hold good for about five or six months, and then the insidious moisture permeates again. Would it not be better to adopt my very simple plan of discarding the jacket altogether? It is absolutely useless, and no stopping is really effectual in resisting for long the daily extremes of heat and cold and damp and dryness these thermometers must undergo.

I have used a thermometer on the grass for the last three years entirely unmounted, and find its indications in no way effected by the loss of its outer coat.

CHARLES H. GRIFFITH

The Rectory, Stratfield Turgiss, Winchfield, Hants,
July 5

Luminous Matter in the Atmosphere

I WAS much interested by M. Waldner's short article on "Luminous Matter in the Atmosphere" in the number of NATURE for Feb. 15, 1872. Being unable to see the particles described, I applied to him for further directions, and he was kind enough to inform me that they may be seen *à vision directe* with a telescope.

I have since found that many of the little bodies may be seen with the naked eye by shutting out the powerful direct and lateral rays. This may be done, *e.g.*, by partly closing the *jalousies* or outside shutters used here, and then looking for the particles at about the distance of quarter of a degree, or of the sun's radius from the border of his disc, when the sun is either just below the upper edge of the shutter, or immediately above the ledge of the house if it looks east and west. Shutters are not always necessary. I have just seen great numbers by standing on the border of the shadow thrown by the adjoining house. Even by holding my hat over my head I can perceive some of them. The chief object to be aimed at is to prevent the eyes from being dazzled by the direct rays of the sun. The same principle explains the reason why stars are sometimes seen during the day from the bottom of a well or through a telescope, and why the red protuberances of the sun become visible during an ordinary or artificial eclipse.

On the 9th and 10th current, and again this morning, there was a haziness round the sun, which gradually diminished as the angular distance from his disc increased, until the sky became beautifully blue at an angle of 25° or 30°. I found that the haziness was produced by the reflection of the sunbeams from innumerable little particles. Many of them were distinctly visible to the naked eye, but many more were seen with an opera-glass or telescope. They passed too rapidly to be counted, but fifty at least were in the field of my glass at one time. I am sure that this is no optical delusion, for several of my friends have seen them too.

What were these little particles? M. Waldner supposes them to be crystals of ice, and they certainly look like miniature snowstorms. Perhaps some of your readers may be able to decide whether the higher particles are composed of ice-like cirri, the loftiest of the clouds. But some of the corpuscles of the lower strata of the air are undoubtedly seeds, little organic substances, insects, &c. I have caught several feathery little seeds of this kind. They are almost imperceptible when seen against some white substance, and are so light that the slightest currents of air waft them to great distances.

Another instance of numberless little vegetable substances being blown here may be cited, namely, the pollen of the pine trees growing on the Landes. An unusually large quantity of this fell here on April 17, 18, 19, and 20, and may probably be traced to three extensive fires of pine woods sixty or eighty miles N.W. of Pau (April 14-16). The pollen was doubtless drawn upwards by a strong current of heated air, and then wafted to Pau by the wind, which blew in the right direction (April 17-19). The wind changed at Bordeaux on the 20th, and the pollen then fell (April 21-22) near Perigueux, nearly as far to the N.E. of the fires as Pau is to the S.E. A correspondent of the *Times* (April 30), mistaking the pollen for sulphur, announced that a shower of this substance had fallen here, and supposed that it was connected with the eruption of Vesuvius, which, however, did not begin until the 24th.

I would suggest that some record should be kept of the direction of the wind which these particles indicate in different strata of the atmosphere in fine weather.
J. F. ANDERSON

4, Place Duplace, Pau, June 12

Vibration of Glasses containing Effervescing Liquids

IT is known that a glass containing effervescing liquid will not give a clear note when struck, and that as the effervescence subsides the tone becomes more and more clear. When the liquid is perfectly tranquil the glass will ring as usual, but on re-exciting the effervescence the musical tone again disappears. Sir John Herschel (Encyc. Met., Art. "Sound"), who states that this experiment appears to have been originally made by Chladin, quotes it as an "example of the stifling and obstruction of the pulses propagated through a medium, from the effect of its non-homogeneity;" and, in explanation of the phenomena, he says:—"We must consider what passes in the communication of vibrations through the liquid from one side of the glass to the other. The glass and contained liquid, to give a musical tone, must vibrate regularly in unison as a system; and it is clear, that if any considerable part of a system be unsusceptible of regular vibration, the whole must be so."

The phenomenon, then, according to this explanation, is due to the fact that the liquid, during effervescence, becomes non-homogeneous, and thus obstructs the passage of the sonorous vibrations from one side of the glass to the other.

It is with much diffidence that I venture to express dissent from so eminent an authority as Herschel; but it does not appear to me that the above explanation is entirely satisfactory, for the following reasons:—

1. It seems probable that the sonorous vibrations pass *round* the glass rather than *across* it. For, if they pass across the glass, that will occur whether it contains water or air. Yet the musical tone of a glass containing air is not destroyed by suspending within it, so as not to touch it, a ball or cylinder of wool or cotton, although the sonorous vibrations certainly cannot pass freely through that substance.

2. If the non-homogeneity of the contained liquid be the cause why the sonorous vibrations will not pass, whence comes it that treacle, clear honey, &c., which are homogeneous fluids, destroy the musical ring of a glass fully filled with any of them?

The phenomenon presents itself to my mind as being due to a certain amount of vibration communicated to the glass by the agitation arising from the effervescence. This vibration—which can be easily heard by placing the ear close to the glass—interferes with that caused by striking the glass, and destroys more

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